The Railway Freight Car Problem

By Donald E. Church

FREIGHT carloadings in recent weeks have been in the heaviest volume since 1930, surpassing even the October peaks of 1939 and 1940. As the growth since the first of the year is expected to continue over coming months, some question has been raised concerning the ability of the railroads to meet prospective carloading requirements. Since a shortage of transportation facilities, such as occurred during the first World War, would have far-reaching repercussions upon the national defense effort, many steps are being taken to forestall such a development.

Breakdown During First World War.

In the first World War, as now, the extent of the growth of traffic had not been foreseen. Eventually the railroads were unable to handle the volumes requested. Indeed, as early as 1916 leading railway terminals became congested and traffic was appreciably slowed despite the carriers' attempts to correct the situation by voluntary action.

The Interstate Commerce Commission also attempted to eliminate the difficulties but lacked the necessary power for putting into effect the measures required. Finally, in a last effort to achieve maximum efficiency through voluntary cooperation, the carriers formed in early 1918 the Railroad's War Board, with outstanding leaders in charge of the organization. For a few months operations were conducted more smoothly, but after this early period the situation again deteriorated and the Government assumed complete control through a railway administration.

A system of priorities had been established hurriedly by the Railroads' War Board, and this was extensively utilized by the Railroad Administration. Priority tags were issued to agents throughout the country. These agents used them too freely on all Government shipments, even when expedited movement was clearly unnecessary. The result was shipment and receipt of a large volume of freight long before it could be utilized, and often before it could be unloaded promptly because of a shortage of maritime shipping facilities and of warehouse space.

Terminals continued to be congested as hundreds of thousands of freight cars stood idle. In effect, the cars unintentionally became temporary warehouses or were unavoidably detained in congested yards at a time when the cars were needed most urgently for moving freight.

Major Developments Since 1920.

Thus, the first World War demonstrated the necessity for coordinating freight loadings and freight car movements not only with available manufacturing facilities, but also with storage, terminal, and ocean shipping facilities, in order that railway efficiency be maintained. In conjunction with the restoration of the roads to their owners in 1920, various organizational changes were achieved that could be of aid in effecting such coordination.

The Transportation Act of 1920 itself drastically changed the regulatory pattern, including broad emergency powers over equipment utilization if these were found to be necessary.

Subsequently, several organizations have been created to assist the normal functioning of the railroads, as well as to be available immediately for emergencies.

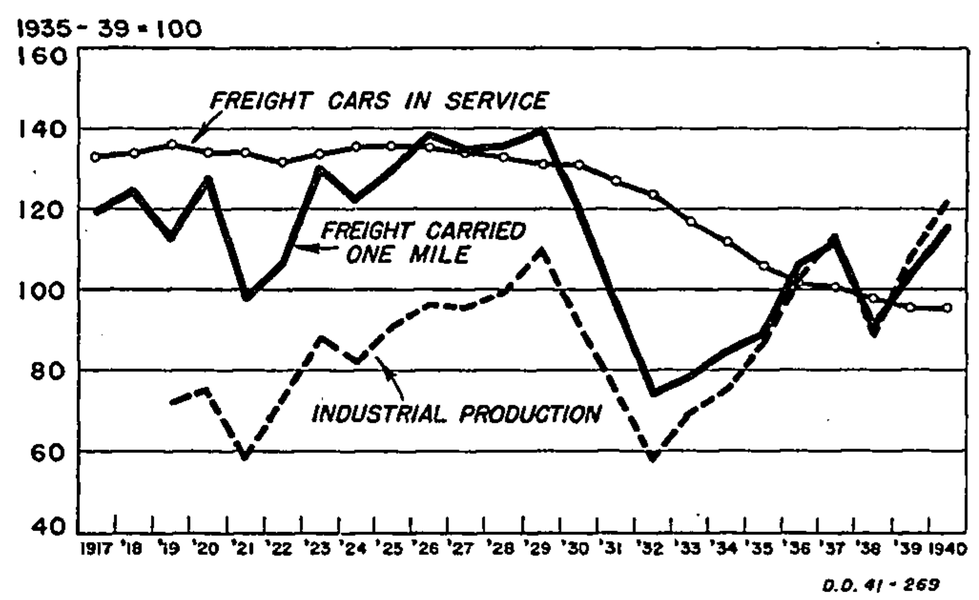

Figure 8.—Indexes of Freight Carried One Mile, Freight Cars in Service, and Industrial Production, 1917–40 (Railroad statistics calculated from data for class I steam railways, excluding switching and terminal companies, published by the Interstate Commerce Commission; industrial production, Board of Governors of the Federal Reserve System).

The Bureau of Service of the Interstate Commerce Commission and the Car Service Division of the Association of American Railroads have experienced field representatives who continuously assist in dealing with problems associated with equipment utilization and who form a nucleus for the application of sweeping mandatory controls by the Interstate Commerce Commission if such control be needed.

Furthermore, the railroads have fostered the development of Shippers' Advisory Boards, in the expectation that cooperation between the carriers and shippers will avoid unnecessary conflicts of interest. In addition, several governmental advisory groups have recently been created.

Another factor of significance in an analysis of the freight problem today is that, in contrast to the almost exclusive reliance upon railroads for domestic transportation prior to the first World War, competing agencies subsequently have become important factors. In 1939, about 62 percent of the Nation's revenue freight ton mileage moved by railroads, while 18 percent was carried by inland water carriers, 12 percent by pipe lines, and 8 percent by intercity trucks.

Although serious shortages of railroad equipment appeared in the early post-war years, improved operating practices made it possible for the railroads to

handle an increasing load up to the all-time peak in 1929 without material change in car ownership. Further improvements in equipment utilization have resulted, in part, from an expenditure upwards of 8 billion dollars since the last World War for additions and betterments of railroad properties. These included such improvements as track straightening, heavier rails, more powerful locomotives, freight cars with larger carrying capacities, as well as the more dramatic installations of Diesel locomotives and streamlined trains.

Prospective Shipper Requirements

The volume of freight traffic to be expected during the coming months is dependent in large part upon the future trends in industrial production, the diversion of shipments from water carriers to the inland agencies, and the special situations that may develop with regard to particular commodity movements. One method [1] that may be used to obtain an approximate forecast of shipper requirements is based largely upon past relationships between carloadings and economic activity, as discussed below.

Relationship Between Carloadings and Business Activity.

The major portion of freight traffic consists of the products of manufacturing, mining, and agriculture. Changes in aggregate loadings occur concurrently with fluctuations in activity in these fields. The most important group of loadings are those which are industrial in nature: including coal, coke, ore, forest products, and miscellaneous shipments. Hence, as figure 8 shows, total movement of freight generally fluctuates with shifts in the level of industrial production.

On the basis of the past relationship between industrial carloadings and production, it is possible to estimate the increase in carloadings which will be produced by a given expansion in economic activity. Figure 9 shows the basis for this. In the upper panel, each dot represents industrial carloadings (vertical scale) and industrial production (horizontal scale) for a single year. The record for the period from 1929 to 1940 is plotted.

If the volume of industrial carloadings depended solely upon industrial production, the dots would have been grouped closely along a line which would show an increase in carloadings associated with an increase in industrial production. However, it may be noted that the dots for early years lie above the apparent general relationship, while those for later years lie increasingly below that line. The progressive reduction in the annual carloadings related to given rates of industrial production is the joint result of a number of factors, such as the diversion of freight to competing forms of transportation, the increase in freight car size, heavier loading per car, and integration and relocation of industries.

An estimate for any given year, therefore, must not only be based upon the level of business activity, but also upon an adjustment for the effect of those last mentioned factors. The line A–B in the upper panel represents an approximation to the normal relationship without an adjustment, while the curved line in the lower panel indicates the approximate allowance to be made from an estimate derived from the line A–B. Primary significance attaches to the net resultant of those two

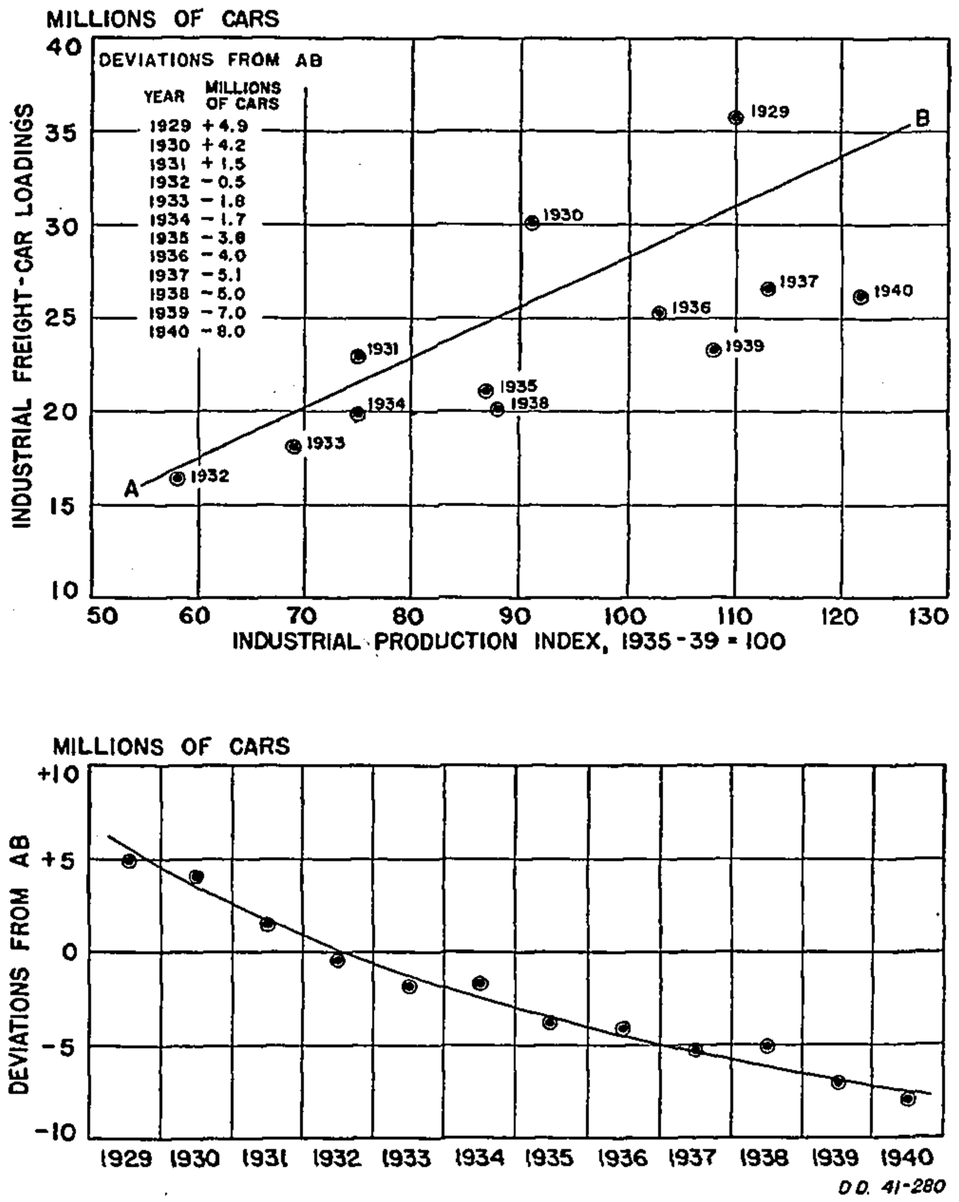

Figure 9.—Relationship Between Cars of Industrial Revenue Freight Loaded and Industrial Production, Adjusted for Declining Trend, 1929–40 (Carloadings, Association of American Railroads, and Industrial Production, Board of Governors of the Federal Reserve System).

NOTE.—Industrial carloadings include coal, coke, ore, forest products, and miscellaneous freight.

separate parts, rather than to the individual amounts from either panel alone.

Estimates for the remaining two broad groups of commodities—less-than-carload shipments and agricultural products—are based on somewhat different methods. After allowing for a downward trend in the total volume of less-than-carload shipments, the cyclical variations are found to be rather closely related to movements in national income adjusted for price changes. In the case of agricultural products since 1933, there appears to be a tendency for the total to remain fairly constant.

Recent Movement of Traffic.

Before applying the foregoing method for estimating future traffic, it is well to review the recent movement of carloadings and industrial activity. The Federal Reserve Board's unadjusted index of industrial production during the first 25 weeks of this year averaged 26 percent above the like period of 1940. Over a similar

[1] Method and estimates supplied by Louis Paradiso, Division of Research and Statistics, Bureau of Foreign and Domestic Commerce.

time, carloadings showed an aggregate increase of 17 percent. The important miscellaneous group experienced a gain of 27 percent or 70,000 cars weekly over last year.

Coal loadings for the period as a whole lagged due to work stoppage at the mines, but recovered in recent weeks to a level nearly 30 percent above a year ago. Meanwhile, other sizable gains were also registered in the movement of coke, ore (favored by the early opening of Lake navigation), forest products, and agricultural loadings (due to a heavy grain movement). The result of these changes has been an advance of total loadings to about 900,000 weekly in the latter part of June, well above the peak weeks of 856, 000 and 838,000 cars attained in the autumns of 1939 and 1940.

Table 1.—Carloadings by Commodity Classifications: Percentage Increase During Selected Periods 1941 Above Corresponding 1935–39 Averages

Commodity	First quarter	April	May
Grain and grain products	4.3	13.3	23.6
Livestock	—10.8	—11.3	—3.6
Coal	15.1	—57.0	37.5
Coke	68.8	43.6	88.7
Forest products	38.4	36.6	35.1
Ore	80.7	208.4	109.1
Merchandise, l. c. l.	—.6	1.4	3.0
Miscellaneous	31.8	32.7	39.2
Total	19.2	14.1	32.7
Total, less coal	20.3	27.1	31.9

Source: Association of American Railroads.

Forecast for 1941.

To forecast the total carloadings for 1941, some judgment must be formed of the possible extent of the upward movement in production and income. It appears that the Federal Reserve index of industrial production will average at least 150 during 1941 and that the national income should equal 85 billion dollars in terms of 1940 prices. Increases of this magnitude would represent an advance over 1940 production and income of 23 and 13 percent, respectively. Translating these gains into carloadings on the basis of past relationships as indicated above would result in loadings this year aggregating about 44 million, or about 20 percent above the 1940 total. In view of the numerically small volume of traffic (on an annual basis) that may be diverted from water carriers and the probable degree of error that is involved in making the estimate, no specific allowance has been made for the various special transportation factors discussed below.

The Seasonal Pattern and Peak Carloading Requirements.

Thus far the discussion of freight car requirements has run in terms of the annual volume of loadings. Of more importance with respect to the capacity of the railroads to handle traffic is the seasonal movement within the year. For if at one time in the year loadings are much heavier than at other times because of seasonal factors that cannot be altered, the railroads should be expected to provide capacity sufficient to meet this peak. As shown in figure 10, traffic follows a fairly definite seasonal pattern which (allowing for holiday interruptions) lifts carloadings gradually from the beginning of the year through July and then more rapidly to a maximum in September and October. It may be noticed that peak loadings in September and October 1940 were somewhat attenuated, principally because an abnormal price situation distorted the usual seasonal movement of coal. The importance of coal loadings may again be seen in the freight movement during April of this year when work stoppage virtually halted shipments of coal from bituminous mines.

The autumn peak in carloadings, measured as the average of the 4 heaviest consecutive weeks,[2] has

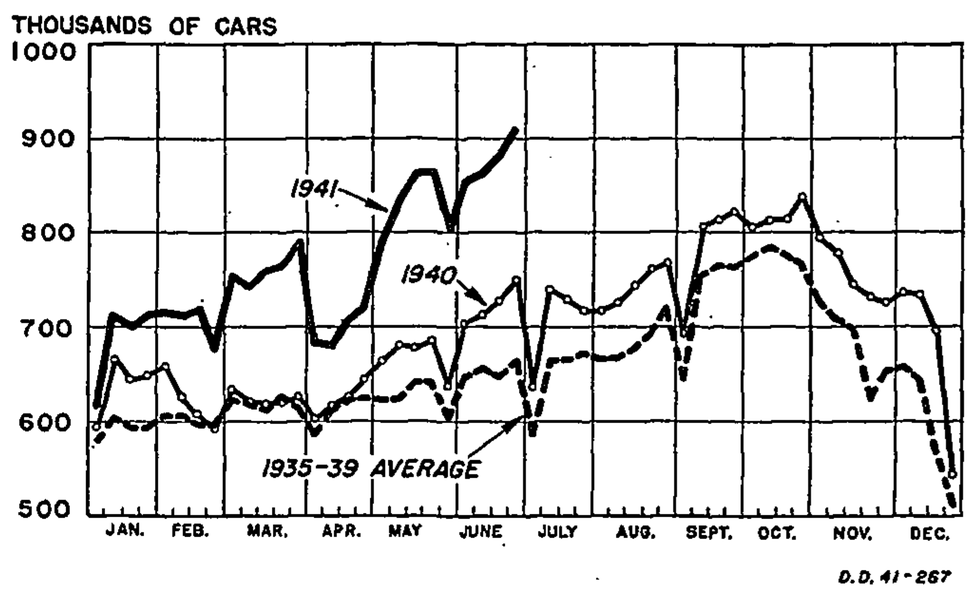

Figure 10.—Total Cars of Revenue Freight Loaded Weekly, 1935–39 Average, 1940 and 1941 (Association of American Railroads).

ranged between 108 percent (1931) and 129 percent (1939) of yearly average carloadings in each of the last 10 years. In about half of those years, the peak has varied between approximately 15 and 20 percent above the annual average. To a marked degree, those variations are related to the trend of industrial production during the late summer and fall months. High seasonal peaks normally coincide with rising business activity, while relatively low seasonal peaks are associated with declining activity.

The seasonal peak for domestic traffic this year is expected to be somewhat lower than would be anticipated from normal relationships because the usual seasonal rise cannot materialize in those industries that already are producing at full capacity. While no accurate estimate has been made of the magnitude of this limiting factor, it probably will be offset approximately by increases caused by diversion of traffic from water carriers. Consequently, after making rough allowances for special factors and using the preceding method for estimation, the peak carloading requirements probably will approximate 1 million weekly during the 4 highest weeks. Moreover, if industrial production continues to advance next year as now expected, peak carloading requirements in 1942 will

[2] Four weeks rather than 1 or 2 weeks is used, as it avoids random variations and indicates a sustained high level.

substantially exceed this figure. These requirements compare with peak loadings in 1929 of 1,187,000 cars, 839,000 in 1939, and 817,000 last year.

The Effect of Ship Diversion.[1]

The discussion above has considered the diversion of traffic from competing carriers only in very general terms. Withdrawal of ships from their normal lanes not only diverts traffic to the railroads and other carriers, but also affects the competitive situation in various markets. Because of changes in those markets, as well as the lack of data regarding specific traffic flows and the potential extent of diversion, opinions vary regarding the amount of freight that may be shifted from maritime shipping to the railroads.

According to preliminary estimates, the volume of shipments that may be diverted from coastwise and intercoastal shipping under present plans probably will not exceed 10,000 or 20,000 carloadings per week. In addition, shipments of tin, rubber, and other products, which normally reach the East Coast from foreign ports on the Pacific Ocean by way of the Panama Canal, will be diverted to the West Coast and then moved by rail. Analogous re-routing of commerce from other foreign ports is either now in effect or is being considered.

While the total volume constitutes only a very small part of the aggregate railroad traffic, it will present a substantial burden when superimposed upon what is likely to be an already tight transportation situation.

The Problem of the Wheat Crop.

Still another "special" situation that is likely to expand requirements somewhat is that which exists in regard to wheat. This year a bumper crop is being harvested, and it is superimposed on a large carry-over from the previous year. Much of the carry-over has been stored in the interior and must be moved to make room for the new crop. As the surplus of box cars on May 31 was less than half as large as at the same time last year, and is close to the minimum required for effective operation, the railroads have taken extraordinary precautions to insure effective car utilization and to prevent the use of cars for temporary storage. Those measures have been aided by cooperative arrangements among the railroads, agricultural organizations, and Government agencies. Largely as a result of orders issued by the Car Service Division of the Association of American Railroads, about 25,000 of the 34,000 average daily surplus box cars on Class I railroads during the week ending May 31 were concentrated in the Central Western and Southwestern regions in preparation for the wheat shipment.

Railroad Capacity

The Freight Car Supply.

The chief limiting factors to railroad capacity at present appear to be the freight car supply and the efficiency with which it will be utilized. As indicated in Fig. 11, the number of freight cars owned or leased by Class I railroads declined for many years, and reached almost equally low levels in September 1939 and December 1940. New installations since the latter date have exceeded retirements by about 17,000 cars, bringing total ownership to 1,656,000 freight cars on June 1, 1941. In addition, there are probably between 300,000 and 400,000 cars owned or leased by smaller railroads and private industries. Owing to the incompleteness of current information regarding this type of equipment and the relatively small changes that may take place, the following discussion is based on cars owned by Class I carriers.

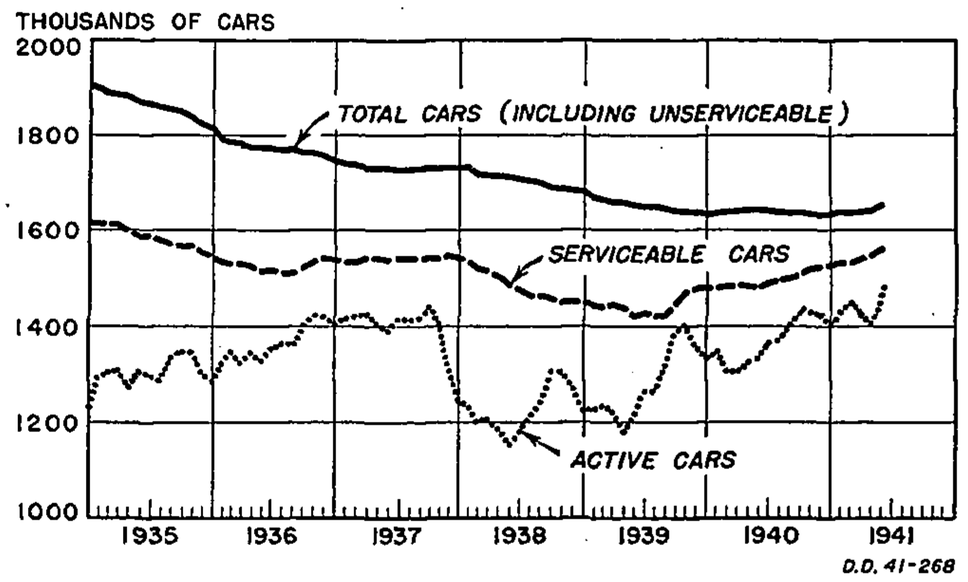

Figure 11.—Total, Serviceable and Active Revenue Freight Cars, Railroad Owned or Leased, 1935–41 (Association of American Railroads).

NOTE.—Data are for the first of each month. The serviceable and active cars are calculated as follows: Total cars less unserviceable cars equals serviceable cars, and this figure less surplus cars equals active cars.

A more satisfactory measure of the freight car supply is the serviceable cars (shown in Fig. 11), which represent total ownership less cars awaiting repairs. The low point in this category was reached in September 1940. Subsequently, it increased 135,000 units and amounted to 1,561,000 on June 1. About 60 percent of that increase probably is attributable to the intensive rehabilitation campaign, which reduced the number of cars awaiting repairs to the lowest point in more than two decades.

During the first 5 months of this year, new car installations declined almost steadily from 6,525 in January to 5,364 in May, and averaged 5,930 per month. To an undetermined extent, this decline may be attributed to the lack of material for construction. However, recent action by the Priorities Division of the Office of Production Management and by the Office of Price Administration and Civilian Supply is expected to relieve shortages of material and to hasten the construction of new equipment.

If new car installations are steadily increased from current levels to twice the present rate by next September, probably not more than 35,000 to 40,000 additional installations may be made between June 1 and October 1. Two other factors, however, must be considered in estimating the number of serviceable cars that are expected to be available next October. Repairs

[1] See p. 9 above for a discussion of diversion of tankers upon petroleum situation.

of "bad order" cars will augment the serviceable supply, while retirements will reduce that supply. During the first 5 months of this year, the reduction in the unserviceable car supply averaged about 2,900 cars per month, while retirements averaged about 4,000 per month.

An undeterminable portion of the reduction in "bad order" car supply merely reflected retirements taken directly from the unserviceable supply, while the rest represented an actual increase in serviceable cars. Since the retirement rate could be raised or lowered readily by allowing compensating changes to occur in the "bad order" supply, a judgment of the probable effect of those two factors upon the serviceable supply should be based on the net difference between retirements and reductions in bad orders.

As indicated above, retirements have exceeded the reduction in unserviceable cars so far this year by about 1,000 cars per month. If approximately that rate continues during the next few months, the net increase in serviceable cars to be expected as a result of new-car output, retirements, and reduction in "bad order" inventory between June 1 and October 1 probably will not exceed 30,000 to 37,000 cars. In round numbers, that increase would raise the serviceable supply to 1,590,000 to 1,600,000 by October 1.

Higher estimates have been published by the Association of American Railroads, indicating that 1,617,000 serviceable cars will be available at that time. In addition, that association has announced a program to increase serviceable cars by 120,000 during 1942 and 150,000 during 1943. As retirements will probably equal at least 40,000 cars during each of these 2 years, the largest new-car building program at least since 1923 will be required. The peak of new-car output during the last two decades was 175,100 in 1923, while the maximum during the "thirties" was 77,000 in 1937.

The Efficiency of Freight Car Utilization.

Now that the probable supply of active freight cars has been indicated, the question arises as to how many freight carloadings a supply of this size can support. In answering this question, one goes straight to the heart of the freight car problem which will be faced in 1941 and 1942—the problem of improving freight car utilization above previous records.

At any one time the active car supply is engaged in either carrying commodities in transit, being loaded or unloaded, standing idle but containing commodities, or returning as empty cars to a particular point. The efficiency of utilization of freight cars may be measured in terms of the number of active cars required to move one carload weekly, as shown in figure 12. That measurement also is frequently expressed in terms of the days required to complete the entire transportation service from one loading to the next and is then designated the "turn-around time."

Thus, the efficiency of utilization summarizes the efficiency of all operations involved in moving freight: the time required in loading and unloading, the distance over which loads are hauled, the speed of freight car movement, the time required for transfers between interconnections, switching, terminal operations, and the time required in making the empty haul to the next carload. Improvement in any of these factors, if not offset by deterioration in others, can better the effi-

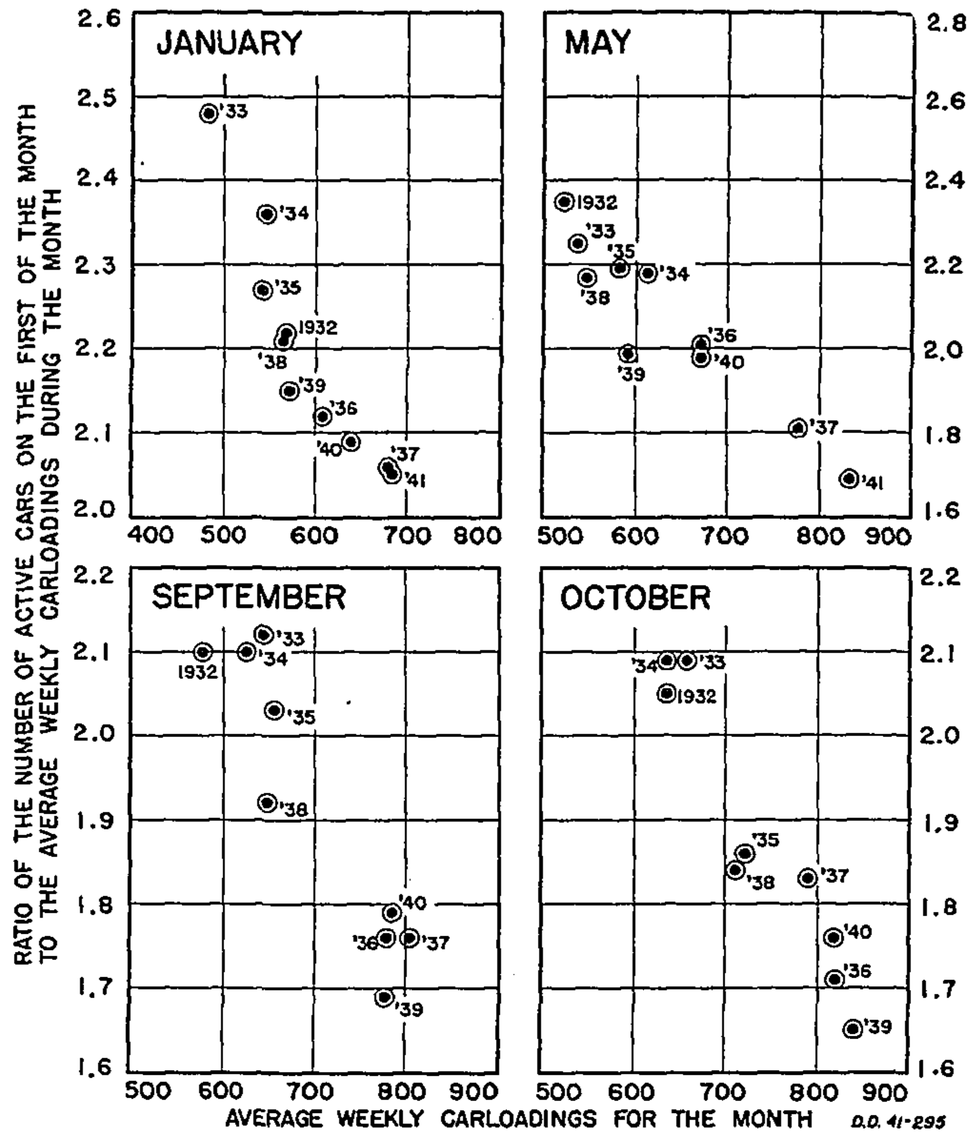

Figure 12.—Utilization of Railroad Owned or Leased Revenue Freight Cars for Selected Months, 1932–41 (Association of American Railroads).

NOTE.—Active cars exclude unserviceable and surplus cars.

ciency of car utilization (lower the average turn-around time).

In the past freight car utilization has fluctuated substantially. Over a period of years an underlying betterment has been apparent, largely for technological reasons. In addition, utilization also varies seasonally, being somewhat lower in the winter than in the summer and fall. But of far greater importance are the variations that are associated with changing levels of traffic. The best utilization was attained in October 1939, when about 1.65 active cars were required to perform one carloading per week.

Further betterments become increasingly difficult for several major reasons. The diversion of shipments from water carriers involves longer than normal hauls, and slower "turn-around" of cars. Sharp changes in the traffic flows create abnormal operating problems which cannot be handled so effectively as under normal movements. As readily available sources for savings become exhausted, further betterments require increasingly drastic measures which may be difficult to apply and often require considerable time to place into effective operation.

Estimated Capacity.

The foregoing utilization ratios should be applied to active cars. Consequently, the estimate of total serviceable cars on October 1 must be adjusted for the minimum surplus cars that will be required to meet promptly the varying levels of traffic demands in various parts of the country. That minimum is believed to be about 65,000 cars. With an estimated serviceable car supply of 1,590,000 to 1,600,000 cars on October 1, the maximum active supply should be approximately 1,525,000 or 1,535,000 cars.

Table 2.—Freight Car Supply, Carloadings, and Utilization Ratio for October Each Year

Year	Serviceable freight cars (thousands)	Daily average surplus [1]	Active cars	Average weekly carloadings	Number of active cars required for 1 carloading weekly
1935	1,567	224	1,343	721	1.86
1936	1,521	119	1,402	819	1.71
1937	1,544	103	1,441	789	1.83
1938	1,460	154	1,306	711	1.84
1939	1,449	67	1,382	839	1.65
1940	1,511	77	1,434	817	1.76

[1] Based on a 1-month period centering on Oct. 1.

NOTE.—See text for discussion of 1941 expectations.

If no improvement in efficiency over the 1939 record (1.65) is achieved, the maximum capacity appears to be about 930,000 carloadings per week. However, some increase appears to be likely. An increase to 1.60 would raise apparent maximum capacity to about 960,000 carloadings weekly, while a further improvement in utilization to better than 1.55 would be required to bring capacity up to 1,000,000 carloadings per week. Since such improvements exceed substantially any previous records, a concrete estimate of the possible betterments that may be obtainable would necessarily have to be based almost entirely upon judgment.

Possibility of Increasing Efficiency of Utilization.

As indicated above, it appears quite evident that at least a tight freight car situation will arise this autumn, unless the efficiency of freight car utilization can be materially increased above past records. A number of things can and are being done to bring about improvement. It is believed that substantial saving of time can be obtained through voluntary action of shippers and carriers. However, if necessary, drastic regulatory powers over the use of equipment and routing of shipments can be established and enforced by the Interstate Commerce Commission.

One promising timesaver is the lengthening of loading and unloading activity to 6 or possibly 7 days per week, even though the shipper may be operating fewer days each week. Furthermore, careful planning of operations and increased use of warehousing should tend to eliminate excessive retention of cars for temporary storage facilities. Avoidance of unnecessarily early spotting of cars in advance of loading also would reduce the idle car time. A number of other specific opportunities are being utilized by organizations active in this effort.

Probably the major opportunities for improvement involve changes in railroad operating practices, especially with respect to terminal movements. Short-routing of empty cars is said to have been voluntarily adopted by most carriers, but probably could be more extensively utilized. While an individual railroad's financial interests usually are enhanced by obtaining

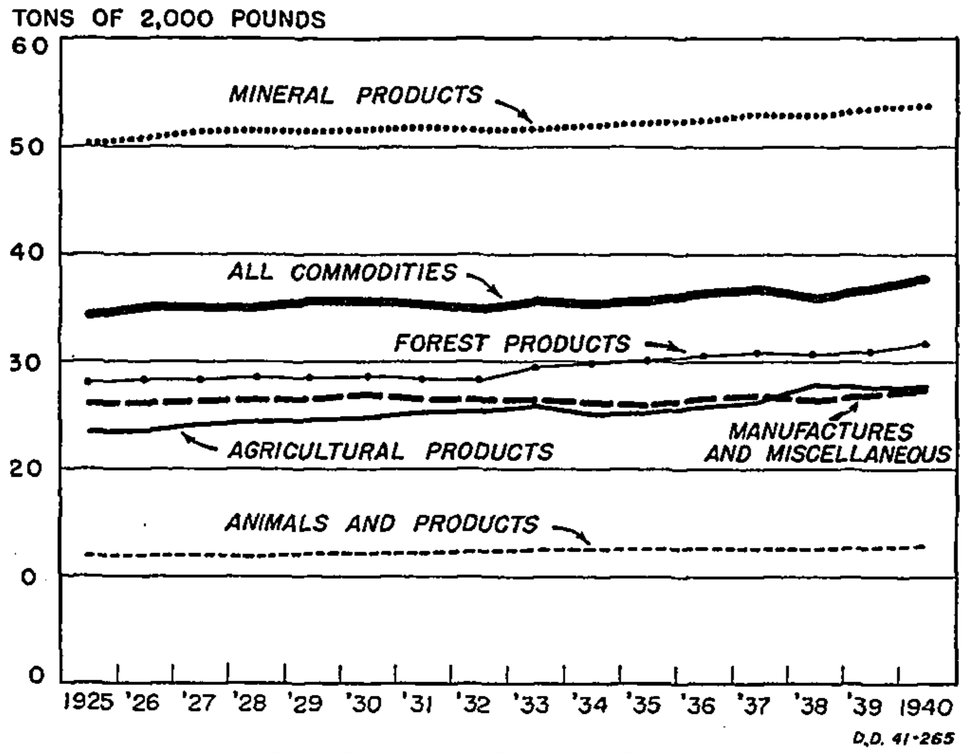

Figure 13.—Average Tons Per Car of Revenue Freight Originated, Class I Steam Railways, 1925–40 (Interstate Commerce Commission).

NOTE.—Data include only full carloads originated or received from switching and terminal companies for road haul by class I haul railways.

the long haul of loaded cars, faster service and improved equipment utilization may be obtained at times if shippers require that the quickest route be used. Additional resort to solid trains to avoid unnecessary switching between terminals, elimination of excessive retention of surplus cars at competitive rail points, and many other detailed steps have also been suggested.

Other Improvements Possible.

In addition to bettering the efficiency of freight car utilization as set forth above, improvements may be made in other respects. One such source is the heavier loading of freight cars. As shown by Fig. 13, the average load per car of carload freight has risen gradually from 34 tons in 1925 to nearly 38 tons in 1940, primarily because of increased car capacities. That increase is largely attributable to heavier loadings of mineral, agricultural, and forest products. On the other hand, the average loading of manufactured products has risen only slightly above the 1930 level despite the increased capacity of box cars. Heavier loading of less-than-carload freight (not included above) also would release cars for other service.

Furthermore, some reduction in the railroad burden may be obtained if necessary by diverting shipments to trucks and to some extent to inland water carriers. This can be accomplished, in part, by arrangements among the individual transportation agencies.

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The Railway Problem Today Different From That of Last War.

It is clear from the above discussion that the current pressing problem differs materially from that during the first World War. At that time, serious transportation difficulties were caused largely by a failure to properly utilize equipment. It is hoped that the activity of railroad, shipper, and governmental agencies, guided by the experiences of that earlier date, will be able not only to forestall any retardation from the current record levels of efficiency, but actually will accomplish a substantial betterment. The extent to which an improvement can be effected remains a question that cannot be determined at present. As indicated above, many promising avenues for improvements appear to be available. On the other hand, factors tending to decrease efficiency also will arise from heavy movements through terminal areas and from sharp changes in traffic flows.

Thus, while the need for additional freight cars is clearly recognized and it is hoped that they will be forthcoming, the main possibility for relieving what will probably be a very tight freight position this autumn appears to lie in bettering the efficiency with which freight cars are utilized.